Space Look and MODIS Calibration and Characterization

August 29, 1994

Marvin S. Maxwell

Data Collection Sequence, for a mirror side, every 1.477 sec.

Number of Samples (in 1Km IFOV)	Action or Object Viewed	Approximate Time from Space View Seconds	Incidence Angle of Scene
--	DC Restore Detectors	-0.47	NA
50	Solar Diffuser	-0.31	-50°
10	SRCA	-0.21	-37°
50	Black Body	-0.12	-26°
50	Space View	0	-11°
--	First Earth Sample	0.17	10.5°
1354	Earth Scan Samples	0.17 to 0.62	----
--	Last Earth Sample	0.62	65.5°

TABLE 1

A Space View observation is made above the Earth's atmosphere

1. just before starting to scan the earth scene to provide a "zero" radiance input measurement.
2. 50 samples of data of space are taken
3. may use YY samples (YY < 50) because of stray light and other considerations in ground processing
4. The Space View is set to a nominal value of about 100 Counts by the Instrument.

All radiometric measurements are determined from the differences between counts in the Space View and the Scene

Space View Counts (Signal) are affected by many things, such as:

1. **Stray Light, therefore not measuring zero scene radiance**

    a. **From the Earth Scene, Solar Diffuser, Space Craft, Moon or ??**

2. **Variations in the Scan Mirror Reflectance and Emissivity as a function of incidence angle of the scene on the scan mirror which is different for the various Bands and compensation may require knowledge of the Scan Mirror temperature to about 1°C.**

    a. **TABLE 1 shows the variation in incidence angle with observation of the objects viewed. Compensation for the incidence angle effects must be applied to all of the affected channels.**

    b. **During testing and in-orbit, contamination and other effects will probably change the reflectance and emissivity of the scan mirror. An in-orbit validation must be done occasionaly to measure this effect. Observation of space shortly after instrument activation and then every 6 months may be adaquate.**

3. **Moon in and/or near the Space View Line of Sight**

    a. **corrupts data when Moon in Line-Of-Sight of Space View**

    b. **increases stray light when near Field Of View**

    c. **May provide calibration check of solar reflective bands if can use Black Body as a reference, or if channel stability is high.**

Low frequency (1/f) noise considerations in processing of Space Look Data

1. **If the low frequency noise is very low it may be desirable to use a weighted running average of the Space Look value to minimize the total noise error from this source in the data.**

    a. **The above approach may work for the VIS and NIR channels, is less likely to be useful for the Photovoltaic IR channels and not likely to be useful for the Photoconductive IR channels.**

    b. **Ground measurements of the channel's 1/f noise characteristics during instrument tests and simulation may be required to optimize the Space Look processing.**

    c. **TABLE 1 shows the time between viewing the various objects which will be used in analyzing the effects of 1/f type noise.**

2. **Combining data from successive Space Looks requires that the MODIS either change the offset's infrequently and/or having precise knowledge of the value of the offsets (in counts) used.**